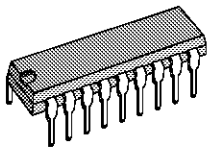
SGS-THOMSON MICROELECTRONICS

**ULQ2801A**
**ULQ2802A - ULQ2803A**
**ULQ2804A - ULQ2805A**

# EIGHT DARLINGTON ARRAYS

- EIGHT DARLINGTONS PER PACKAGE
- **EXTENDED TEMPERATURE RANGE (– 40 to 105°C)**
- OUTPUT CURRENT TO 500mA
- OUTPUT VOLTAGE TO 50V
- INTEGRAL SUPPRESSION DIODES
- VERSIONS FOR ALL POPULAR LOGIC FAMILIES
- OUTPUT CAN BE PARALLELED
- INPUTS PINNED OPPOSITE OUTPUTS TO SIMPLIFY BOARD LAYOUT



**DIP18**
(Plastic Package)

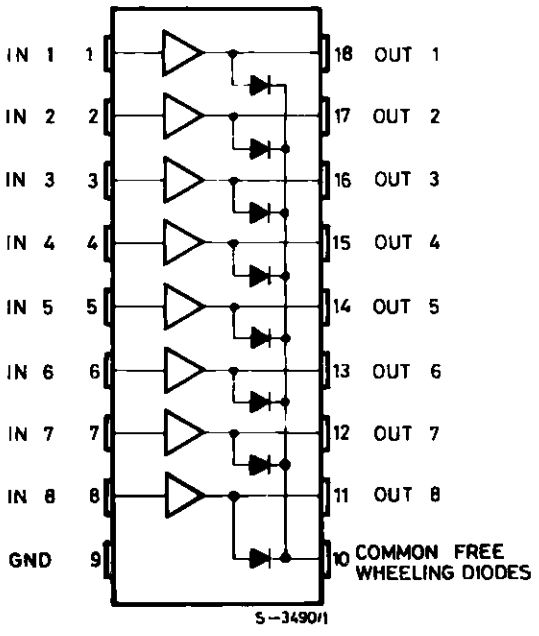
## DESCRIPTION

The ULQ2801A-ULQ2805A each contain eight darlington transistors with common emitters and integral suppression diodes for inductive loads. Each darlington features a peak load current rating of 600mA (500mA continuous) and can withstand at least 50V in the off state. Outputs may be paralleled for higher current capability.

Five versions are available to simplify interfacing to standard logic families : the ULQ2801A is designed for general purpose applications with a current limit resistor ; the ULQ2802A has a 10.5kΩ input resistor and zener for 14-25V PMOS ; the ULQ2803A has a 2.7kΩ input resistor for 5V TTL and CMOS ; the ULQ2804A has a 10.5kΩ input resistor for 6-15V CMOS and the ULQ2805A is designed to sink a minimum of 350mA for standard and Schottky TTL where higher output current is required.

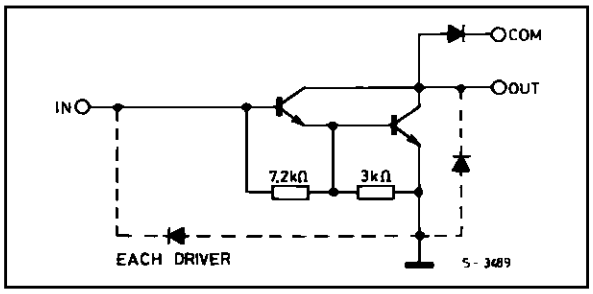
All types are supplied in a 18-lead plastic DIP with a copper lead frame and feature the convenient input-opposite-output pinout to simplify board layout.

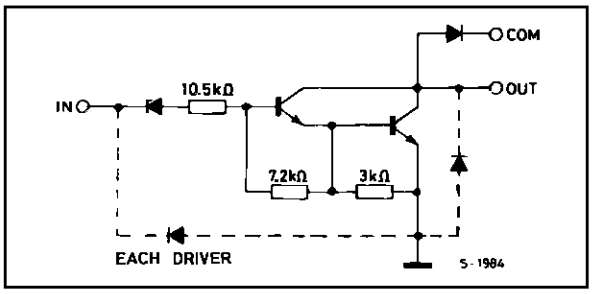
**PIN CONNECTION** (top view)



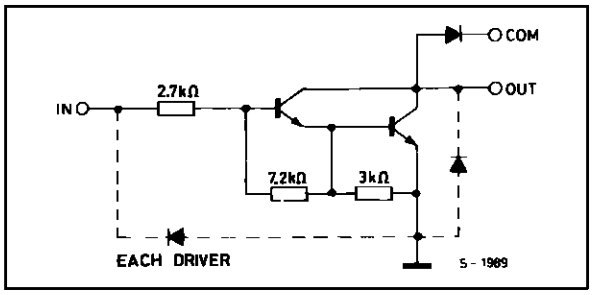
## SCHEMATIC DIAGRAM AND ORDER CODES

For ULQ2801A (each driver for PMOS-CMOS) For ULQ2802A (each driver for 14-15 V PMOS)

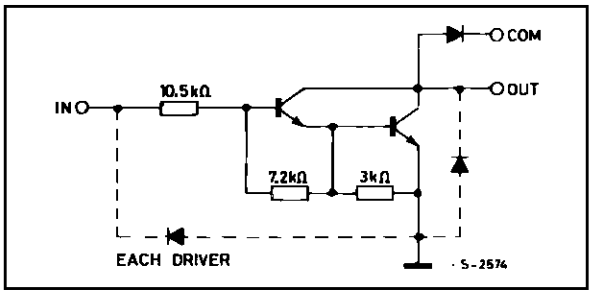


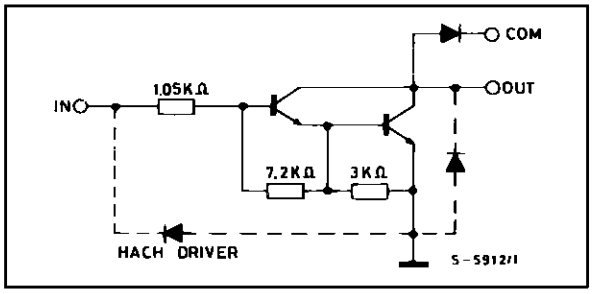

For ULQ2803A (each driver for 5 V, TTL/CMOS)




For ULQ2804A (each driver for 6-15 V CMOS/PMOS




For ULQ2805A (each driver for high out TTL)




## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_o$ | Output Voltage | 50 | V |
| $V_i$ | Input Voltage for ULQ2802A, 2803A, 2804A<br>for ULQ2805A | 30<br>15 | V<br>V |
| $I_C$ | Continuous Collector Current | 500 | mA |
| $I_B$ | Continuous Base Current | 25 | mA |
| $P_{tot}$ | Power Dissipation (one Darlington pair)<br>(total package) | 1.0<br>2.25 | W<br>W |
| $T_{amb}$ | Operating Ambient Temperature Range | – 40 to 105 | °C |
| $T_{stg}$ | Storage Temperature Range | – 55 to 150 | °C |

## THERMAL DATA

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{th\ j\text{-}amb}$ | Thermal Resistance Junction-ambient | Max. | 55 | °C/W |

**ELECTRICAL CHARACTERISTICS** ($T_j$ = –40 to 105°C, unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit | Fig. |
|---|---|---|---|---|---|---|---|
| $I_{CEX}$ | Output Leakage Current | $V_{CE}$ = 50V | | | 50 | µA | 1a |
| | | $T_J$ = 105°C, $V_{CE}$ = 50V | | | 100 | µA | 1a |
| | | $T_J$ = 105°C | | | | | |
| | | for **ULQ2802A** $V_{CE}$ = 50V, $V_i$ = 6V | | | 500 | µA | 1b |
| | | for **ULQ2804A** $V_{CE}$ = 50V, $V_i$ = 1V | | | 500 | µA | 1b |
| $V_{CE\ (sat)}$ | Collector-emitter Saturation Voltage | $I_C$ = 100mA, $I_B$ = 250µA | | 0.9 | 1.1 | V | |
| | | $I_C$ = 200mA, $I_B$ = 350µA | | 1.1 | 1.3 | V | 2 |
| | | $I_C$ = 350mA, $I_B$ = 500µA | | 1.3 | 1.6 | V | |
| $I_{i(on)}$ | Input Current | for **ULQ2802A** $V_i$ = 17V | | 0.82 | 1.25 | mA | |
| | | for **ULQ2803A** $V_i$ = 3.85V | | 0.93 | 1.35 | mA | |
| | | for **ULQ2804A** $V_i$ = 5V | | 0.35 | 0.5 | mA | 3 |
| | | $V_i$ = 12V | | 1 | 1.45 | mA | |
| | | for **ULQ2805A** $V_i$ = 3V | | 1.5 | 2.4 | mA | |
| $I_{i(off)}$ | Input Current | $T_J$ = 105°C, $I_C$ = 500µA | 50 | 65 | | µA | 4 |
| $V_{i(on)}$ | Input Voltage | for **ULQ2802A** $V_{CE}$ = 2V, $I_c$ = 300mA | | | 13 | V | |
| | | for **ULQ2803A** $V_{CE}$ = 2V, $I_c$ = 200mA | | | 2.4 | V | |
| | | $V_{CE}$ = 2V, $I_c$ = 250mA | | | 2.7 | V | |
| | | $V_{CE}$ = 2V, $I_c$ = 300mA | | | 3 | V | |
| | | for **ULQ2804A** $V_{CE}$ = 2V, $I_c$ = 125mA | | | 5 | V | 5 |
| | | $V_{CE}$ = 2V, $I_c$ = 200mA | | | 6 | V | |
| | | $V_{CE}$ = 2V, $I_c$ = 275mA | | | 7 | V | |
| | | $V_{CE}$ = 2V, $I_c$ = 350mA | | | 8 | V | |
| | | for **ULQ2805A** $V_{CE}$ = 2V, $I_c$ = 350mA | | | 2.4 | V | |
| $h_{FE}$ | DC Forward Current Gain | for **ULQ2802A** $V_{CE}$ = 2V, $I_c$ = 350mA | 1000 | | | – | 2 |
| $C_i$ | Input Capacitance | | | 15 | 25 (*) | pF | – |
| $t_{PLH}$ | Turn-on Delay Time | 0.5 $V_i$ to 0.5 $V_o$ | | 0.25 | 1 (*) | µs | – |
| $t_{PHL}$ | Turn-off Delay Time | 0.5 $V_i$ to 0.5 $V_o$ | | 0.25 | 1 (*) | µs | – |
| $I_R$ | Clamp Diode Leakage Current | $V_R$ = 50V | | | 50 | µA | 6 |
| | | $T_J$ = 105°C, $V_R$ = 50V | | | 100 | µA | |
| $V_F$ | Clamp Diode Forward Voltage | $I_F$ = 350mA | | 1.7 | 2 | V | 7 |

(*) Guaranteed by design

## TEST CIRCUITS

**Figure 1a.**

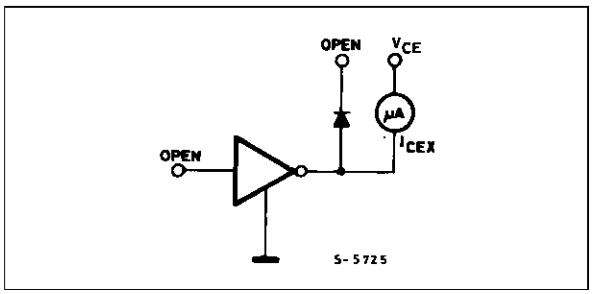



**Figure 1b.**

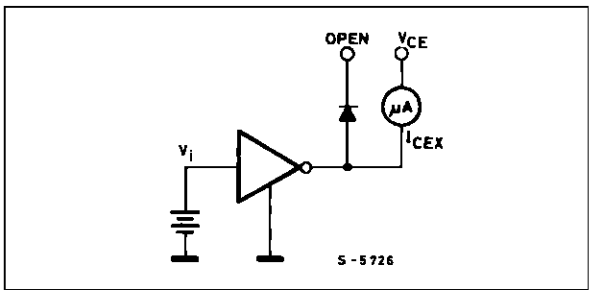



**Figure 2.**

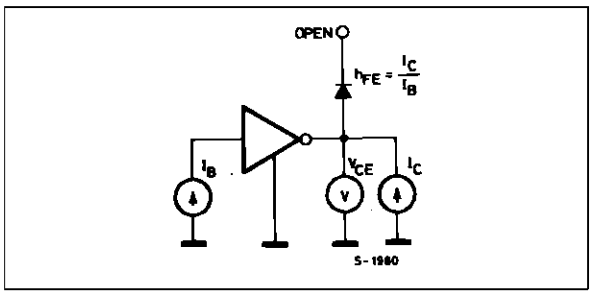



**Figure 3.**

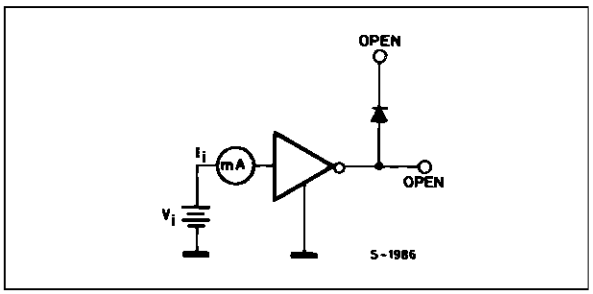



**Figure 4.**

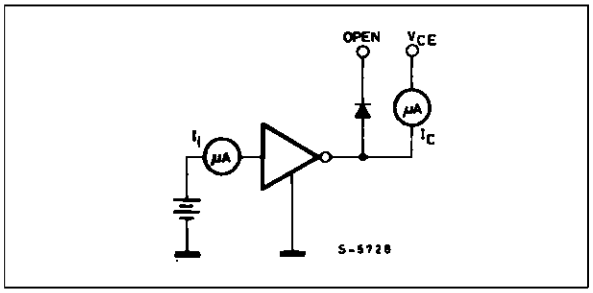



**Figure 5.**

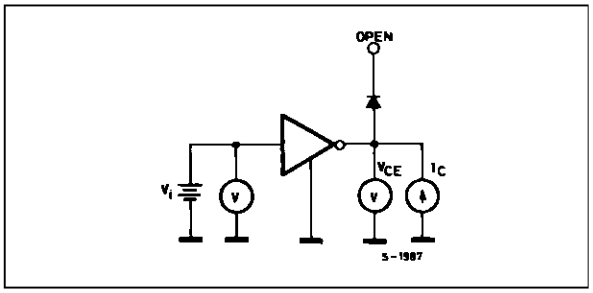



**Figure 6.**

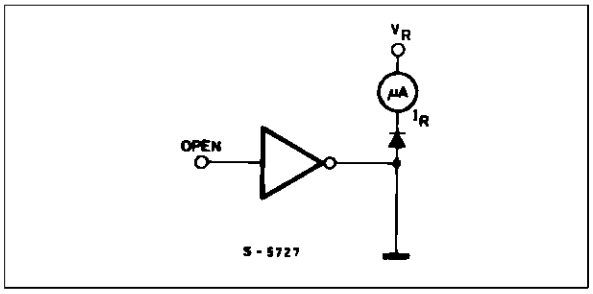



**Figure 7.**

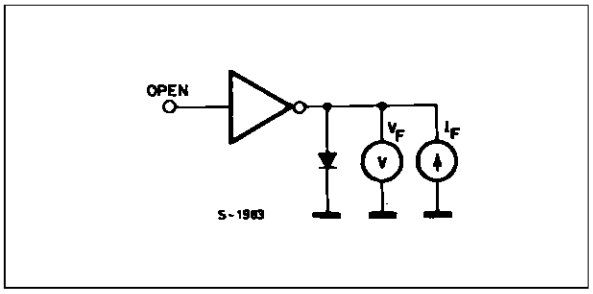


**Figure 8 :** Collector Current as a Function of Saturation Voltage.

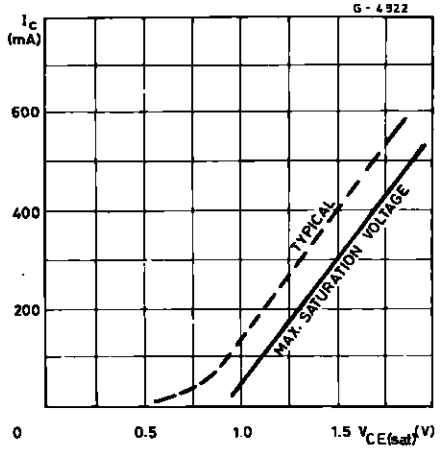



**Figure 9 :** Collector Current as a Function of Input Current.

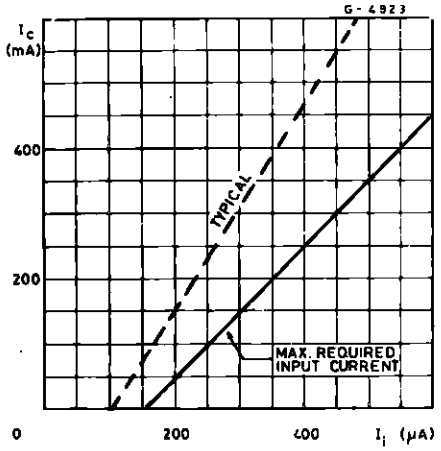



**Figure 10 :** Allowable Average Power Dissipation as a Function of Ambient Temperature.

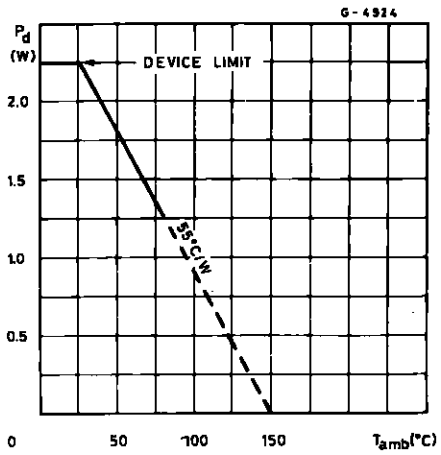



**Figure 11 :** Peak Collector Current as a Function of Duty Cycle.

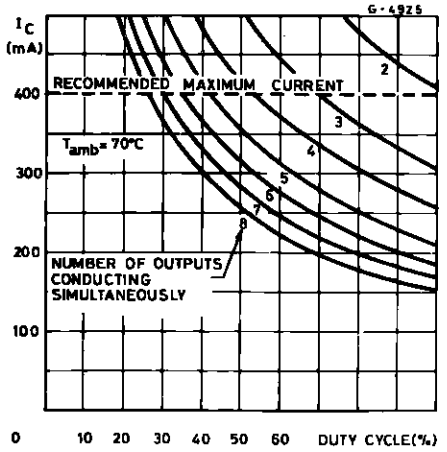



**Figure 12 :** Peak Collector Current as a Function of Duty.

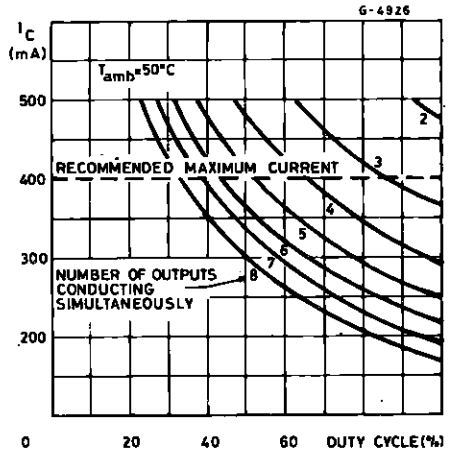



**Figure 13 :** Input Current as a Function of Input Voltage (for ULQ2802A).

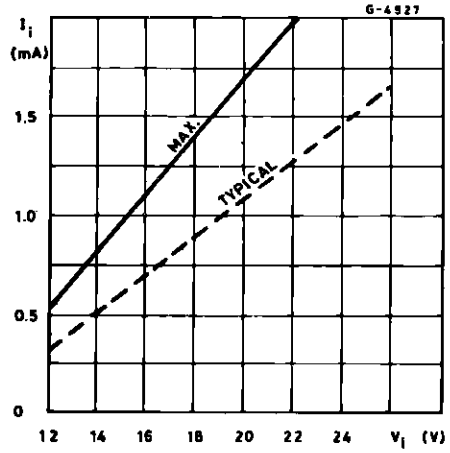


**Figure 14 :** Input Current as a Function of Input Voltage (for ULQ2804A)

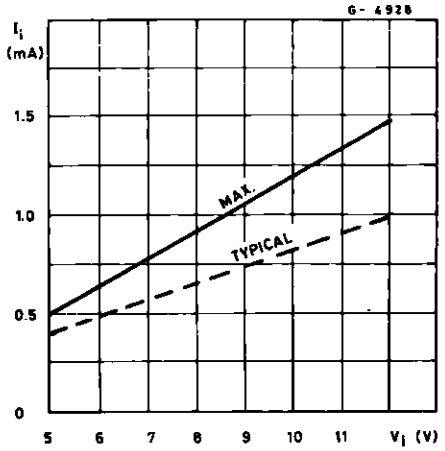



**Figure 15 :** Input Current as a Function of Input Voltage (for ULQ2803A)

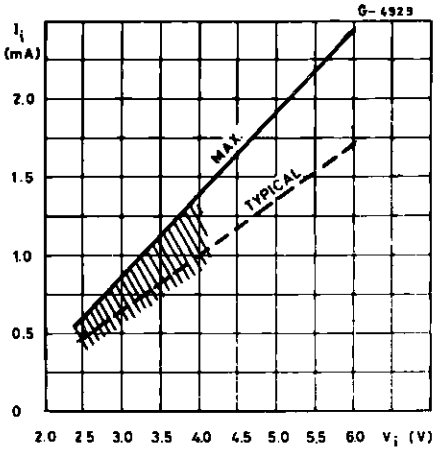
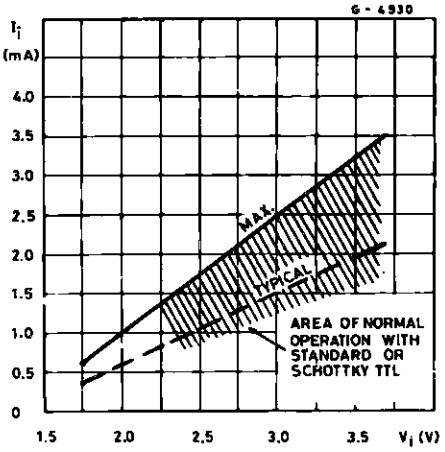



**Figure 16 :** Input Current as a Function of Input Voltage (for ULQ2805A)



## DIP18 PACKAGE MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.254 | | | 0.010 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.46 | | | 0.018 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 23.24 | | | 0.915 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 20.32 | | | 0.800 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 3.93 | | | 0.155 |
| L | | 3.3 | | | 0.130 | |
| Z | | 1.27 | 1.59 | | 0.050 | 0.063 |